Installation and Operation Manual
X-PR-SolidSense II-PT-eng
Part Number: 541B160AAG
July, 2011

Brooks® SolidSense II® Series Pressure Transducer

SolidSense II Pressure Transducer Pigtail Configuration

SolidSense II Pressure Transducer 9-Pin Flow Thru Configuration

SolidSense II Pressure Transducer with Readout Configuration

SolidSense II Pressure Transducer with Bendix® Configuration

Essential Instructions
Read before proceeding!

Brooks Instrument designs, manufactures and tests its products to meet many national and international standards. These products must be properly installed, operated and maintained to ensure they continue to operate within their normal specifications. The following instructions must be adhered to and integrated into your safety program when installing, operating and maintaining Brooks Instrument products.

- To ensure proper performance, use qualified personnel to install, operate, update, program and maintain the product.
- Read all instructions prior to installing, operating and servicing the product. If this instruction manual is not the correct manual, please see back cover for local sales office contact information. Save this instruction manual for future reference.

⚠ **WARNING: Do not operate this instrument in excess of the specifications listed in the Instruction and Operation Manual. Failure to heed this warning can result in serious personal injury and / or damage to the equipment.**

- If you do not understand any of the instructions, contact your Brooks Instrument representative for clarification.
- Follow all warnings, cautions and instructions marked on and supplied with the product.
- Install your equipment as specified in the installation instructions of the appropriate instruction manual and per applicable local and national codes. Connect all products to the proper electrical and pressure sources.
- Operation: (1) Slowly initiate flow into the system. Open process valves slowly to avoid flow surges. (2) Check for leaks around the flow meter inlet and outlet connections. If no leaks are present, bring the system up to the operating pressure.
- Please make sure that the process line pressure is removed prior to service. When replacement parts are required, ensure that qualified people use replacement parts specified by Brooks Instrument. Unauthorized parts and procedures can affect the product's performance and place the safe operation of your process at risk. Look-alike substitutions may result in fire, electrical hazards or improper operation.
- Ensure that all equipment doors are closed and protective covers are in place to prevent electrical shock and personal injury, except when maintenance is being performed by qualified persons.

⚠ **WARNING: For liquid flow devices, if the inlet and outlet valves adjacent to the devices are to be closed for any reason, the devices must be completely drained. Failure to do so may result in thermal expansion of the liquid that can rupture the device and may cause personal injury.**

European Pressure Equipment Directive (PED)

All pressure equipment with an internal pressure greater than 0.5 bar (g) and a size larger than 25mm or 1" (inch) falls under the Pressure Equipment Directive (PED).

- The Specifications Section of this manual contains instructions related to the PED directive.
- Meters described in this manual are in compliance with EN directive 97/23/EC.
- All Brooks Instrument Flowmeters fall under fluid group 1.
- Meters larger than 25mm or 1" (inch) are in compliance with PED category I, II or III.
- Meters of 25mm or 1" (inch) or smaller are Sound Engineering Practice (SEP).

European Electromagnetic Compatibility (EMC)

The Brooks Instrument (electric/electronic) equipment bearing the CE mark has been successfully tested to the regulations of the Electro Magnetic Compatibility (2004/108/EC (EMC directive 89/336/EEC)).
Special attention however is required when selecting the signal cable to be used with CE marked equipment.

Quality of the signal cable, cable glands and connectors:

Brooks Instrument supplies high quality cable(s) which meets the specifications for CE certification.
If you provide your own signal cable you should use a cable which is overall completely screened with a 100% shield.
"D" or "Circular" type connectors used should be shielded with a metal shield. If applicable, metal cable glands must be used providing cable screen clamping.
The cable screen should be connected to the metal shell or gland and shielded at both ends over 360 Degrees.
The shield should be terminated to an earth ground.
Card Edge Connectors are standard non-metallic. The cables used must be screened with 100% shield to comply with CE certification.
The shield should be terminated to an earth ground.
For pin configuration : Please refer to the enclosed Instruction Manual.

ESD (Electrostatic Discharge)

⚠ **CAUTION: This instrument contains electronic components that are susceptible to damage by static electricity. Proper handling procedures must be observed during the removal, installation or other handling of internal circuit boards or devices.**

Handling Procedure:

1. Power to unit must be removed.
2. Personnel must be grounded, via a wrist strap or other safe, suitable means before any printed circuit card or other internal device is installed, removed or adjusted.
3. Printed circuit cards must be transported in a conductive container. Boards must not be removed from protective enclosure until immediately before installation. Removed boards must immediately be placed in protective container for transport, storage or return to factory.

Comments

This instrument is not unique in its content of ESD (electrostatic discharge) sensitive components. Most modern electronic designs contain components that utilize metal oxide technology (NMOS, SMOS, etc.). Experience has proven that even small amounts of static electricity can damage or destroy these devices. Damaged components, even though they appear to function properly, exhibit early failure.

Dear Customer,

We appreciate this opportunity to service your pressure measurement and control requirements with a Brooks Instrument device. Every day, customers all over the world turn to Brooks Instrument for solutions to their gas and liquid control applications. Brooks provides an array of flow, pressure and level measurement and control products for various industries from biopharmaceuticals, oil and gas, fuel cell research and chemicals, to medical devices, analytical instrumentation, semiconductor manufacturing, and more.

The Brooks product you have just received is of the highest quality available, offering superior performance, reliability and value to the user. It is designed with the ever changing process conditions, accuracy requirements and hostile process environments in mind to provide you with a lifetime of dependable service.

We recommend that you read this manual in its entirety. Should you require any additional information concerning Brooks products and services, please contact your local Brooks Sales and Service Office listed on the back cover of this manual or visit www.BrooksInstrument.com.

Yours sincerely,

Brooks Instrument

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1-1 Introduction

This manual covers the Brooks® SolidSense II® Series pressure transducers as shown in Figure 1-1 below. Included herein is general information, operating specifications, installation, removal instructions and product warranty information.

This manual is organized into the following sections:

Section 1 - Introduction
Section 2 - Installation
Back Cover - Limited Warranty and Contacts

It is recommended that this manual be read in its entirety before attempting to operate the Brooks SolidSense II Series devices.

Figure 1-1 SolidSense II Pressure Transducer Configurations

1-2 Intended Use

The Brooks SolidSense II Series pressure transducers meet the most rigid semiconductor and industrial high purity application requirements. With accuracy of 0.25% of full scale, SolidSense II pressure transducers are used to provide years of reliable pressure monitoring in a variety of applications. The SolidSense II Series pressure transducers have one of the smallest footprints in the industry for quick and easy installation in the tightest areas.

1-3 Notice and Caution Statements

Warning, caution and notice statements are located throughout this manual in the ANSI format. A WARNING statement indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury. A CAUTION statement indicates a potentially hazardous situation which, if not avoided, MAY result in minor or moderate injury. It may also be used to alert against unsafe practices. A NOTICE statement describes specific information that requires special attention.

1-4 Product Description Code

The following Product Description Code (PDC) identifies the SolidSense II pressure transducer in various configurations. This code is used to order your SolidSense II pressure transducer. Call your Brooks Service and Support Representative if you need assistance.

Code Description	Code Option	Option Description
I. Base Model Code	GF	Pressure Transducer
II. Body Type	D	Dead End
	F	Flow Through
III. PSI	00	30
	01	100
	02	250
	05	300
	10	1000
	25	2500
	30	3000
IV. Pressure Reference	A	Absolute
	C	Compound
	G	Gauge
V. Output	3	0.00 to 10.00 Vdc
	4	4 to 20 mA
	5	0.05 to 5.05 Vdc
VI. Electrical Connection	P	6’ (2m) Pigtial
	M	5” (0.127m) Pigtail
VII.Fittings	4S	Tube Stub 1/4” O.D. (GFD Only)
	CS	Surface Mount, 1.125” C-Seal, Standard (GFD Only)
	CH	Surface Mount, 1.5” High Flow K1H (GFD Only)
	SC	Surface Mount, 1.5” C-Seal (GFD Only)
	5W	Surface Mount, 1.5” W-Seal (GFD Only)
	4W	Surface Mount, 1.125” W-Seal (GFD Only)
	VM/VCR	Face Seal, fixed male (x2 on Duncan T for GFF)
	VS	Face Seal, fixed male/swivel female on Duncan T (GFF Only)
	SM	Face Seal, swivel male (x2 on Duncan T for GFF)
	SF	Face Seal, swivel female (x2 on Duncan T for GFF)
	4T	Duncan T, 1/4” Tube Stub (GFF Only)
	3T	Duncan T, 3/8” Tube Stub (GFF Only)
	3M	Duncan T, 3/8” with Face Seal, swivel male (GFF Only)
	2T	Duncan T, 1/2” Tube Stub (GFF Only)

Sample Model Code

I	II	III	IV	V	VI	VII
GF	F	02	C	4	P	SF

1-5 SolidSense II Pressure Transducer Specifications

⚠WARNING

Do not operate this instrument in excess of the specifications listed in this manual. Failure to heed this warning can result in serious personal injury and/or damage to the equipment.

Category	Operating Guidelines
Electrical	
Supply Current	Max. 10 mA for 0.00 Vdc and 0.05 to 5.05 Vdc Output
Power Requirement	10 to 30 Vdc for 4 to 20 mA Output 11 to 30 Vdc for 0.05 to 5.05 Output 13 to 32 Vdc for 0.00 to 10.00 Output
Connections	4-Pin Bendix connector 6 ft. (2m) Pigtail (24 AWG shielded cable) 15-Pin D-Sub HD male connection
Protection	Reverse polarity for power connections
Mechanical	
Housing	Stainless Steel, Polymer Plastics
Proof Pressure	200% of ful scale (F.S.) up to 1000 PSI 150% of F.S. for higher ranges
Burst Pressure	400% of F.S.
Wetted Parts	316L Stainless Steel, SEMI F20
Surface Finish	Compliant to SEMI F19, 5 Ra Standard
Cleanliness	Compliant to ASTM F1374-92 (2005)
Internal Volume	1.79 cc
Process Connection	Refer to PDC (paragraph 1-2) for options
Shipping Weight (approximate)	0.70 lbs. (0.32 kg)
Performance	
Accuracy	$\pm$0.25% BFSL (Linearity, Hysterisis and Repeatability)
Response Time	< 5 msec
Thermal Zero and Span Shift (each)	$\geq$ 100 PSI Range F.S. $\pm$0.02% F.S./^{O}F (-4^{O} to 140^{O}F, -20^{O} to 60^{O}C) $\pm$0.05% F.S. (-20^{O} to 60^{O}C) for 0-10 Vdc version < 100 PSI Range F.S. $\pm$0.04% F.S./^{O}F (-4^{O} to 140^{O}F, -20^{O} to 60^{O}C) $\pm$1.0% F.S. (20^{O} to 60^{O}FC) for 0-10 Vdc version
Temperature	Storage: -20^{O} to 180^{O}F (-29^{O} to 82^{O}C) Compensated: -4^{O} to 140^{O}F, (-20^{O} to 60^{O}C) Compensated: 20^{O} to 140^{O}F (20^{O} to 60^{O}C) for 0-10 Vdc version
Certifications	
FM Approved	Non-Incendive for use in Class 1, Div 2, Groups A, B, C and D Excludes 0-10 Vdc and 15-Pin D Sub HD male connection
CE	Compliant to EMC Directive 2004/108/EC
RoHS	Compliant to EU Directive 2002/95/EC
ATEX*	Compliant to EU Directive 94/9/EC

*SolidSense II ATEX Pressure Transmitter Only

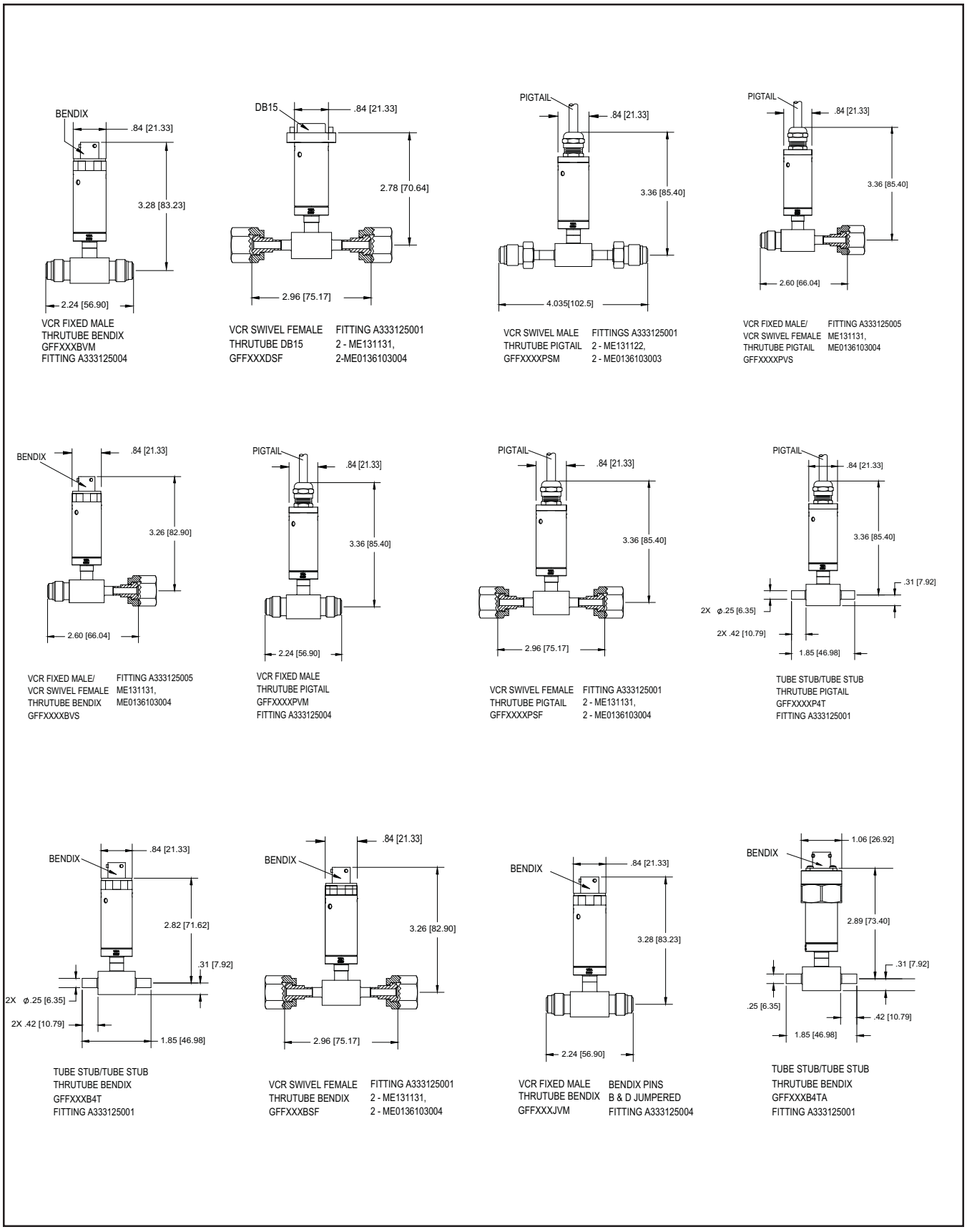


Figure 1-2A SolidSense II Pressure Transducer Dimensions for Thru-Tubes with DB15, Bendix and Pigtail Connections

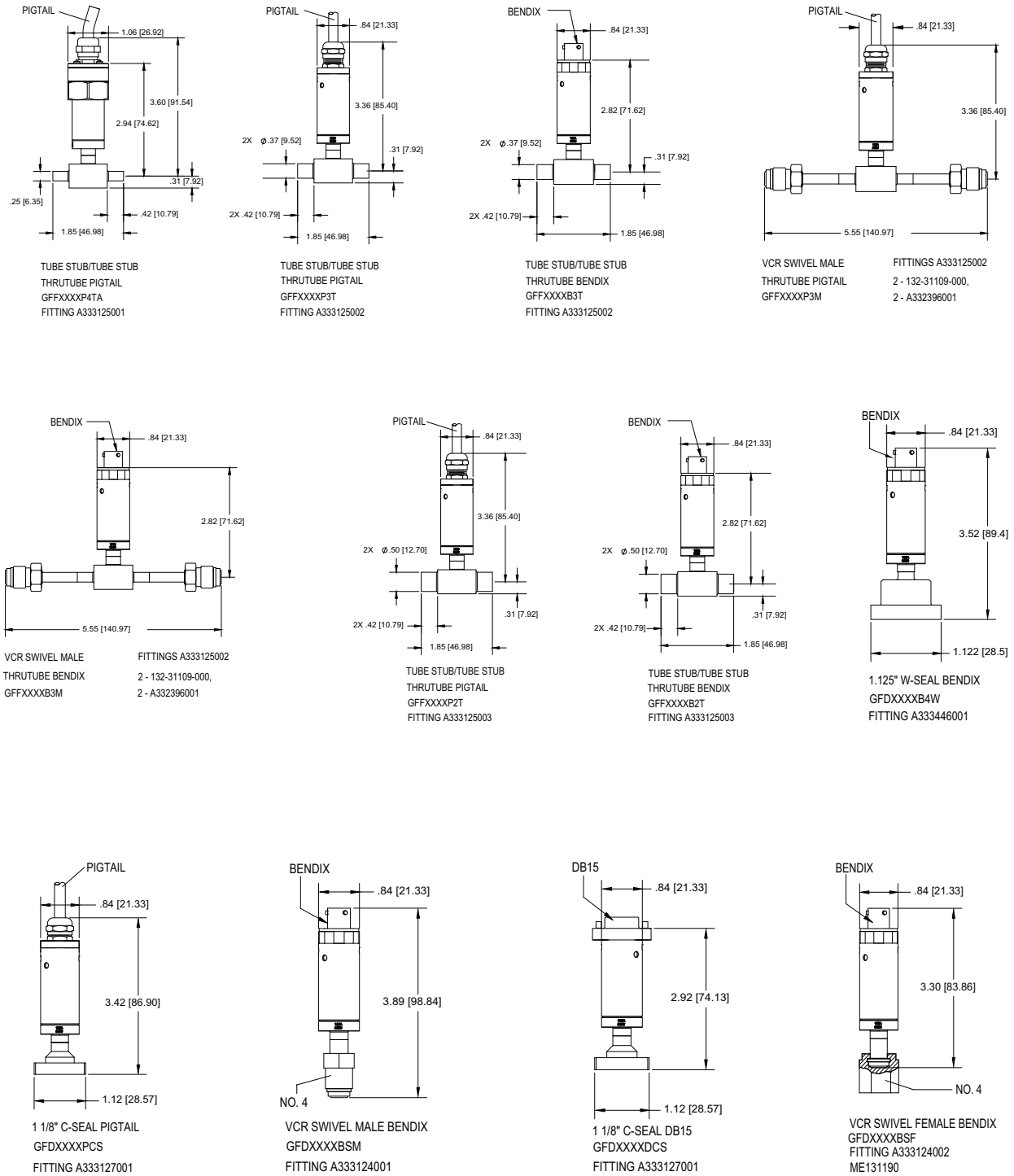


Figure 1-2B SolidSense II Pressure Transducer Dimensions for Thru-Tubes/Dead-End with DB15, Bendix and Pigtail Connections

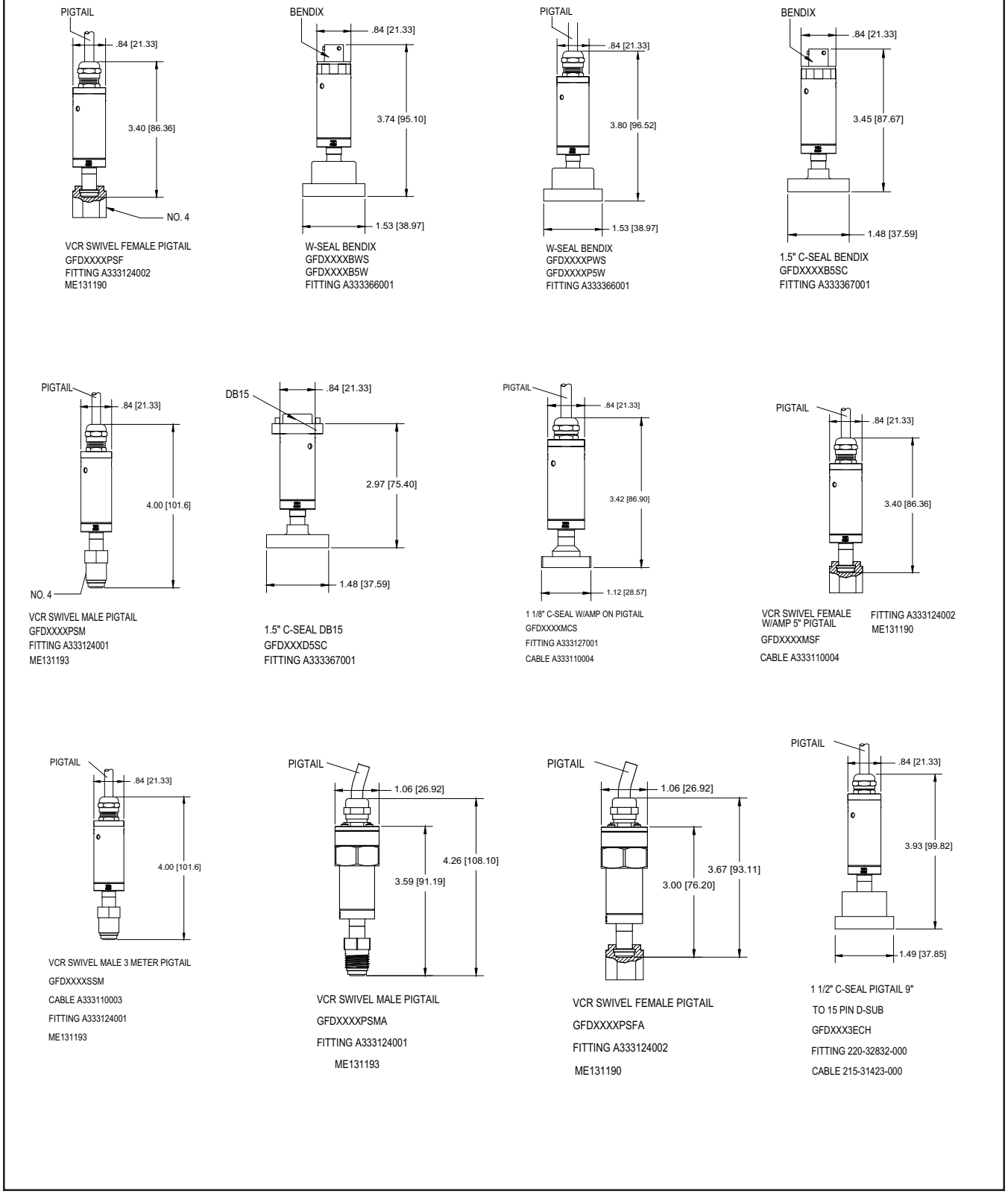
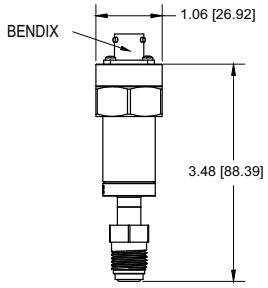
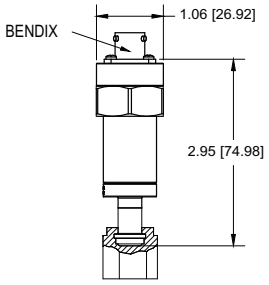


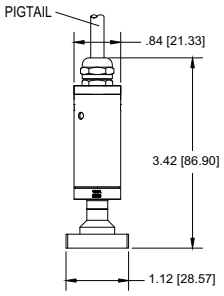
Figure 1-2C SolidSense II Pressure Transducer Dimensions for Dead-End with DB15, Bendix and Pigtail Connections



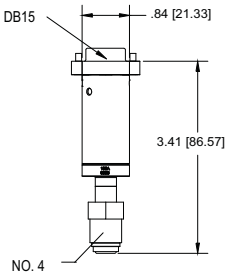
VCR SWIVEL MALE BENDIX
GFDXXXXBSMA
FITTING A333124001
ME131193



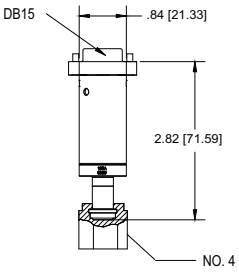
VCR SWIVEL FEMALE BENDIX
GFDXXXXBSFA
FITTING A333124002
ME131190



1 1/8" C-SEAL PIGTAIL 9" TO 15 PIN
D-SUB
GFDXXX3ECS
FITTING A333127001
CABLE 215-31423-000



VCR SWIVEL MALE DB15
GFDXXXXDSM
FITTING A333124001
ME131193



VCR SWIVEL FEMALE DB15
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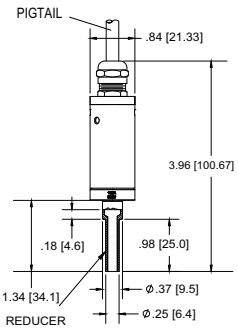
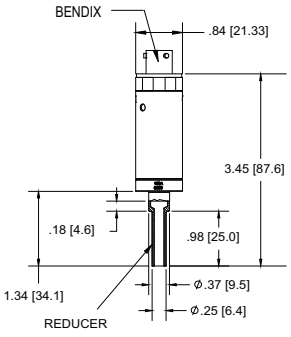
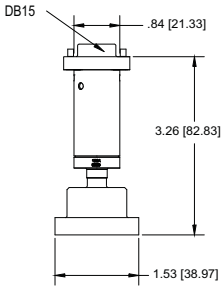
FITTING A333124002
ME131190



TUBE STUB
GFDXXXXP4SR



TUBE STUB
GFDXXXXB4SR



W-SEAL DB15
GFDXXXXD5W
FITTING A333366001

Figure 1-2D SolidSense II Pressure Transducer Dimensions for Dead-End with DB15, Bendix and Pigtail Connections

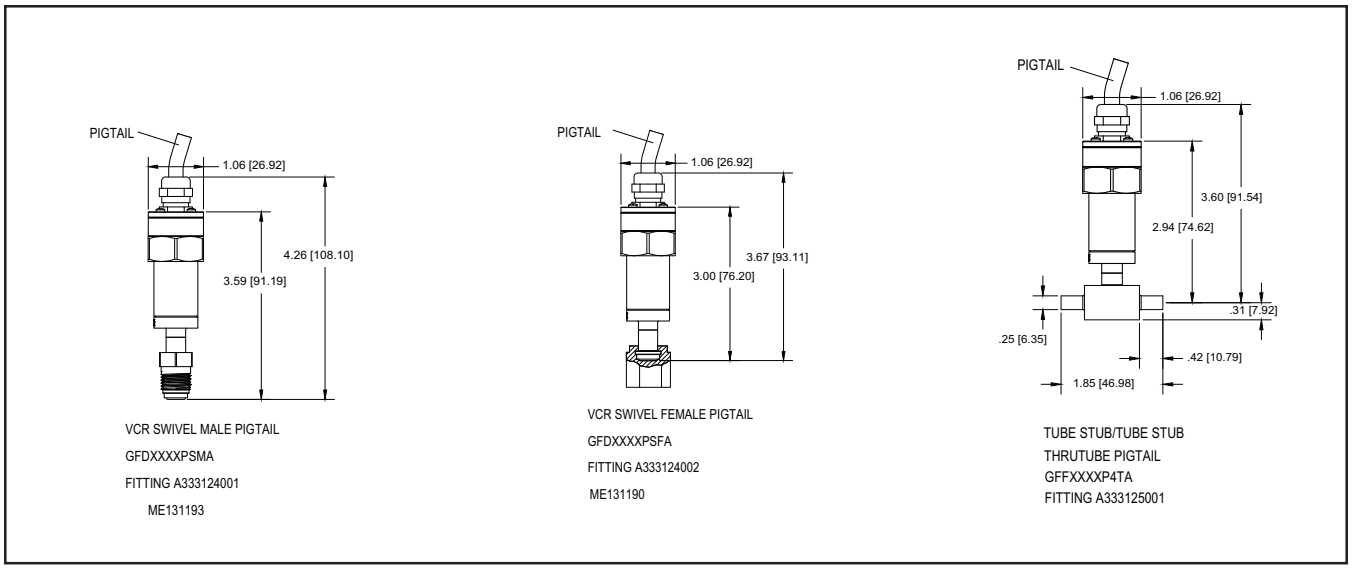


Figure 1-3 SolidSense II ATEX Pressure Transmitter(Option) Dimensions

For more details on the SolidSense II ATEX compliant pressure transmitters, visit our website at www.BrooksInstrument.com/Products for the data sheet: **DS-PR-SolidSense II ATEX-PT-eng** or contact your nearest Brooks Customer Service Center for assistance.

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2-1 General

This section provides installation instructions for the Brooks® SolidSense II pressure transducers . Refer to Section 1 of this manual for dimensions.

2-2 Receipt of Equipment

When the instrument is received, the outside packing case should be checked for damage incurred during shipment. If the packing case is damaged, the local carrier should be notified at once regarding his liability. A report should be submitted to your nearest Product Service Department.

Brooks Instrument
407 W. Vine Street
P.O. Box 903
Hatfield, PA 19440 USA
Toll Free (888) 554 FLOW (3569)
Tel (215) 362 3700
Fax (215) 362 3745
E-mail: BrooksAm@BrooksInstrument.com
www.BrooksInstrument.com

Brooks Instrument
Neonstraat 3
6718 WX Ede, Netherlands
P.O. Box 428
6710 BK Ede, Netherlands
Tel +31 (0) 318 549 300
Fax +31 (0) 318 549 309
E-mail: BrooksEu@BrooksInstrument.com

Brooks Instrument
1-4-4 Kitasuna Koto-Ku
Tokyo, 136-0073 Japan
Tel +81 (0) 3 5633 7100
Fax +81 (0) 3 5633 7101
Email: BrooksAs@BrooksInstrument.com

Remove the envelope containing the packing list. Carefully remove the instrument from the packing case. Make sure spare parts are not discarded with the packing materials. Inspect for damaged or missing parts.

2-3 Recommended Storage Practice

If intermediate or long-term storage of equipment is required, it is recommended that the equipment be stored in accordance with the following:

a. Within the original shipping container.
b. Ambient temperature 21°C (70°F) nominal, 79°C (175°F) maximum -29°C (-20°F) minimum.
c. Relative humidity 45% nominal, 60% maximum, 25% minimum.

2-4 Return Shipment

Prior to returning any device to the factory, visit the Brooks web site (www.BrooksInstrument.com) for a Return Materials Authorization Number (RMA#), or contact one of the locations provided on p. 2-1.

Prior to returning the device, it must be purged in accordance with the following:

⚠ WARNING

Before returning the device purge thoroughly with a dry inert gas such as Nitrogen before disconnecting gas connections. Failure to correctly purge the instrument could result in fire, explosion or death. Corrosion or contamination may occur upon exposure to air.

All devices returned to Brooks require completion of Form RPR003-1, Brooks Instrument Decontamination Statement, along with a Material Safety Data Sheet (MSDS) for the fluid(s) used in the instrument. Failure to provide this information will delay processing by Brooks personnel. Copies of these forms can be downloaded from the Brooks website (www.BrooksInstrument.com) or are available from any of the Brooks Instrument locations provided on p. 2-1.

2-5 Transit Precautions

To safeguard against damage during transit, transport the device to the installation site in the same container used for transportation from the factory, if circumstances permit.

2-6 Removal from Storage

Upon removal of the device from storage, a visual inspection should be conducted to verify its "as-received" condition. If the device has been subject to storage conditions in excess of those recommended (refer to "2-3 Recommended Storage Practice" on p. 2-1), if applicable, it should be subjected to a pneumatic pressure test in accordance with applicable vessel codes.

2-7 Mechanical Connections

Failure to follow these procedures may adversely affect the product's performance and could void the product warranty. Inspect, but DO NOT unwrap any parts until installation. Contact your Brooks representative with any problems.

⚠ CAUTION

Failure to follow these procedures may adversely affect the product's performance and could void the product warranty. Inspect but DO NOT unwrap any parts until installation. Contact your Brooks representative with any problems.

1. The SolidSense II pressure transducer is double-bagged for cleanroom service and should remain packaged until installation. DO NOT remove the pressure transducer from the protective bag unless you are in a clean environment.

   a. Remove the pressure transducer from the box and carry it into the gray area.

   b. Remove te outer protective bag and discard.

   c. Carry the pressure transducer (sealed in inner bag) into the clean room.

⚠ CAUTION

HANDLE CAREFULLY! This SolidSense II pressure transducer is a precision instrument and works by measuring stress. Therefore, the less stress placed on the SolidSense II pressure transducer during installation and handling, the greater its accuracy and life span will be.

2. Install the SolidSense II pressure transducer.

   a. Prepare the connection fitting in place on the gas line. Any other fitting components, such as stainless steel gaskets, should be blown clean with filtered gas before use.

   b. Maintain a flow of at least 1 slpm (0.05 scfm) of inert gas during installation to minimize tubing and pressure transducer contamination from environ-mental moisture and particles. The recommended purge gas is electronic-grade Nitrogen.

   c. Open the inner bag and remove the pressure transducer. Remove any fitting protection caps and seat the pressure transducer on the mating connections.

   d. For connections compatible with VCR® fittings: Tighten by hand. Then turn the fitting 1/8 turn past finger-tight using a wrench.

⚠ CAUTION

DO NOT overtighten fittings. Refer to specific technical guidelines that are supplies through the fitting manufacturer.

3. Prepare the SolidSense II pressure transducer for use.

   a. Verify integrity of the seal by appropriate helium leak-testing procedures.

b. Turn the gas flow ON then OFF, 10 times to remove any particles generated during installation. (The flow rate used should at least equal the process flow specifications.)

c. Mechanical Installation is complete. Complete the electrical wiring connec-tions as noted in the next section.

2-8 Electrical Connections

⚠ NOTICE

Grounding of the cable braid and drain wire are necessary in order to comply with CE immunity requirements. A shielded cable is permanently connected to the SolidSense II pressure transducer.

Electrical Wiring diagrams are shown in Figures 2-1 through 2-6. Connect the cable braid and drain wire to an earth ground to help reduce inductive signal interference.

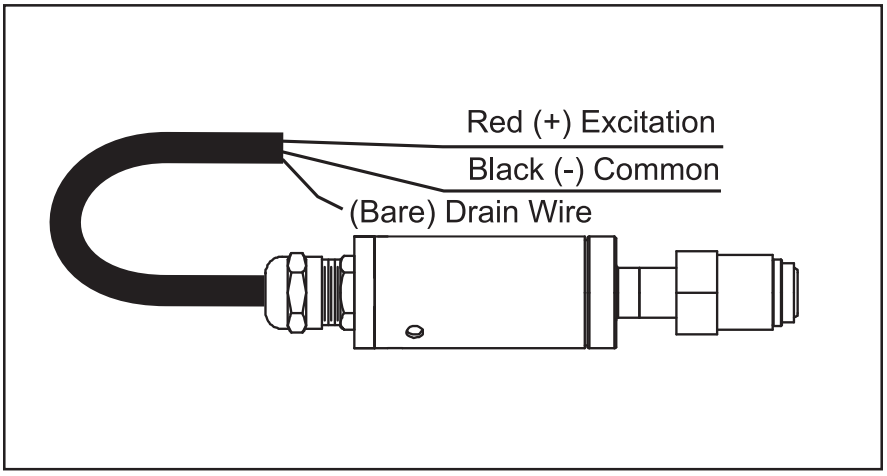


Figure 2-1 4-20 mA Pigtail Cable Wiring

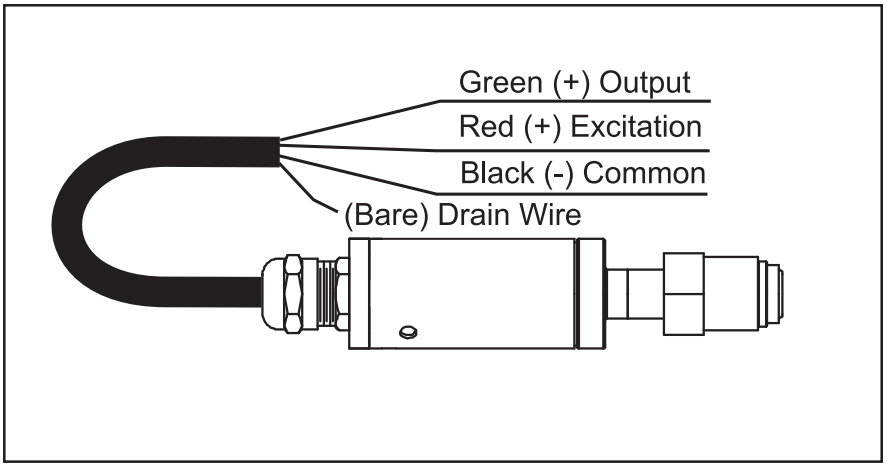


Figure 2-2 0-5 Vdc or 0-10 Vdc Pigtail Cable Wiring

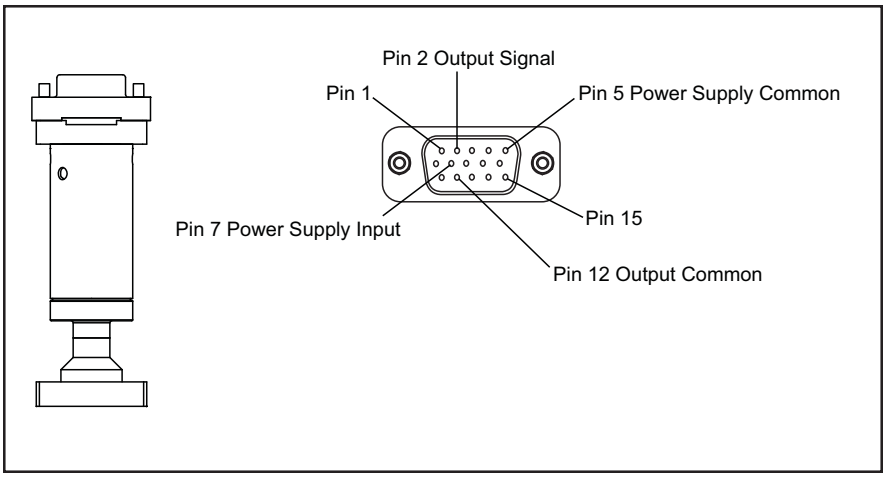


Figure 2-3 15-Pin D-Sub HD Connector Wiring Pinout

The Bendix connector cable has a removable, 4-pin locking connector with a shielded cable. The connector cable is available from Brooks under part number: EL3000032010.

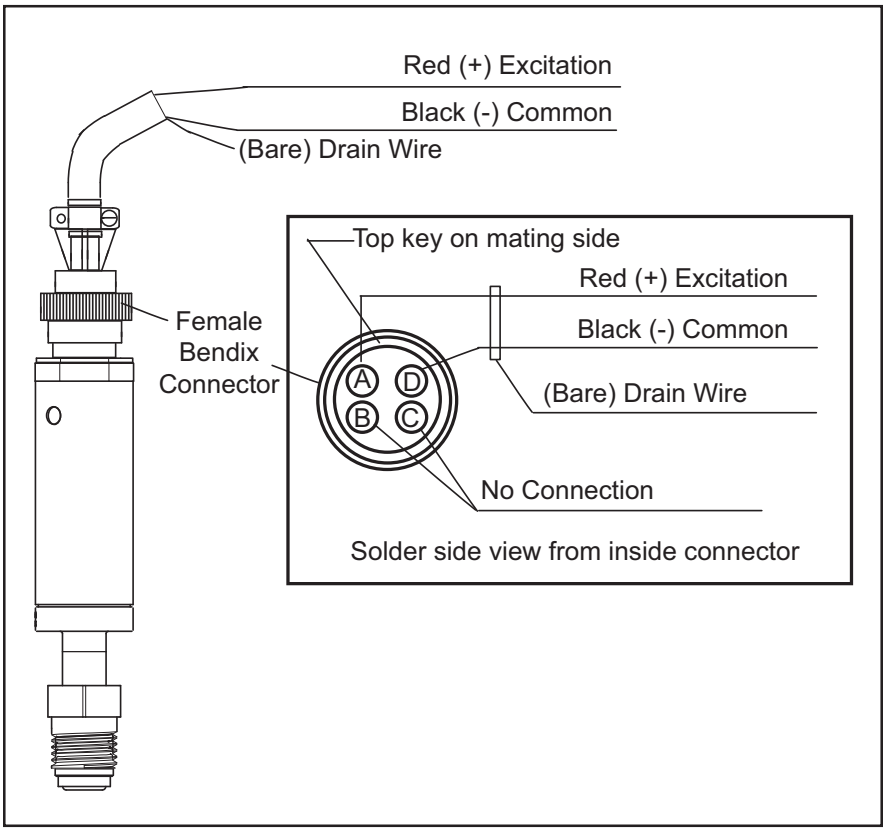


Figure 2-4 4-20 mA Bendix Cable Wiring

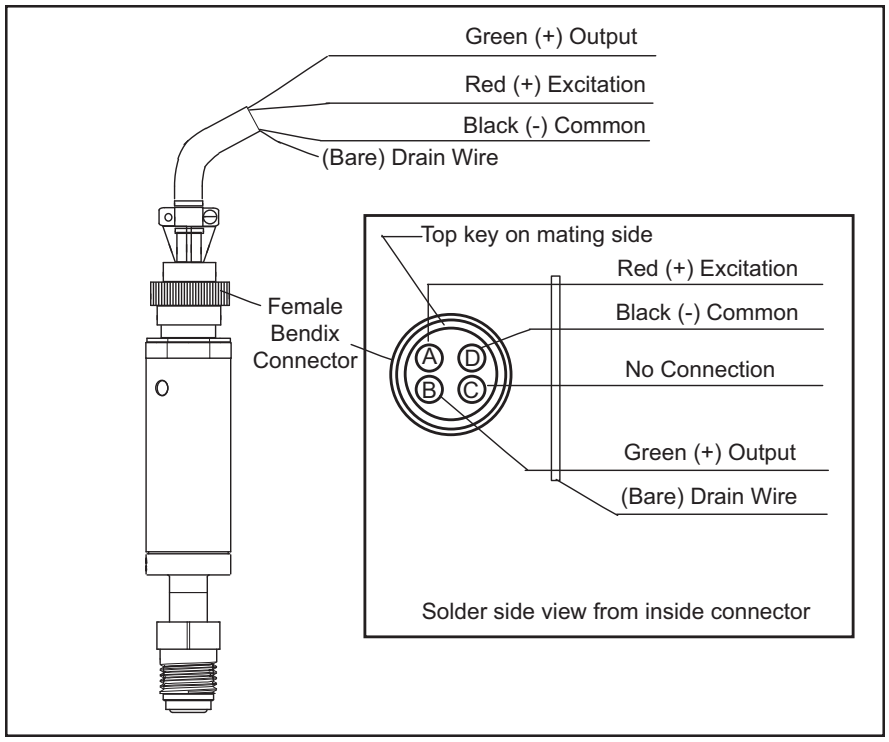


Figure 2-5 0-5 Vdc or 0-10 Vdc Bendix Cable Wiring

The SolidSense II pressure transducer can be wired directly to a 12 or 24 Vdc LR056. The pigtail cable is connected as shown in Figure 2-6.

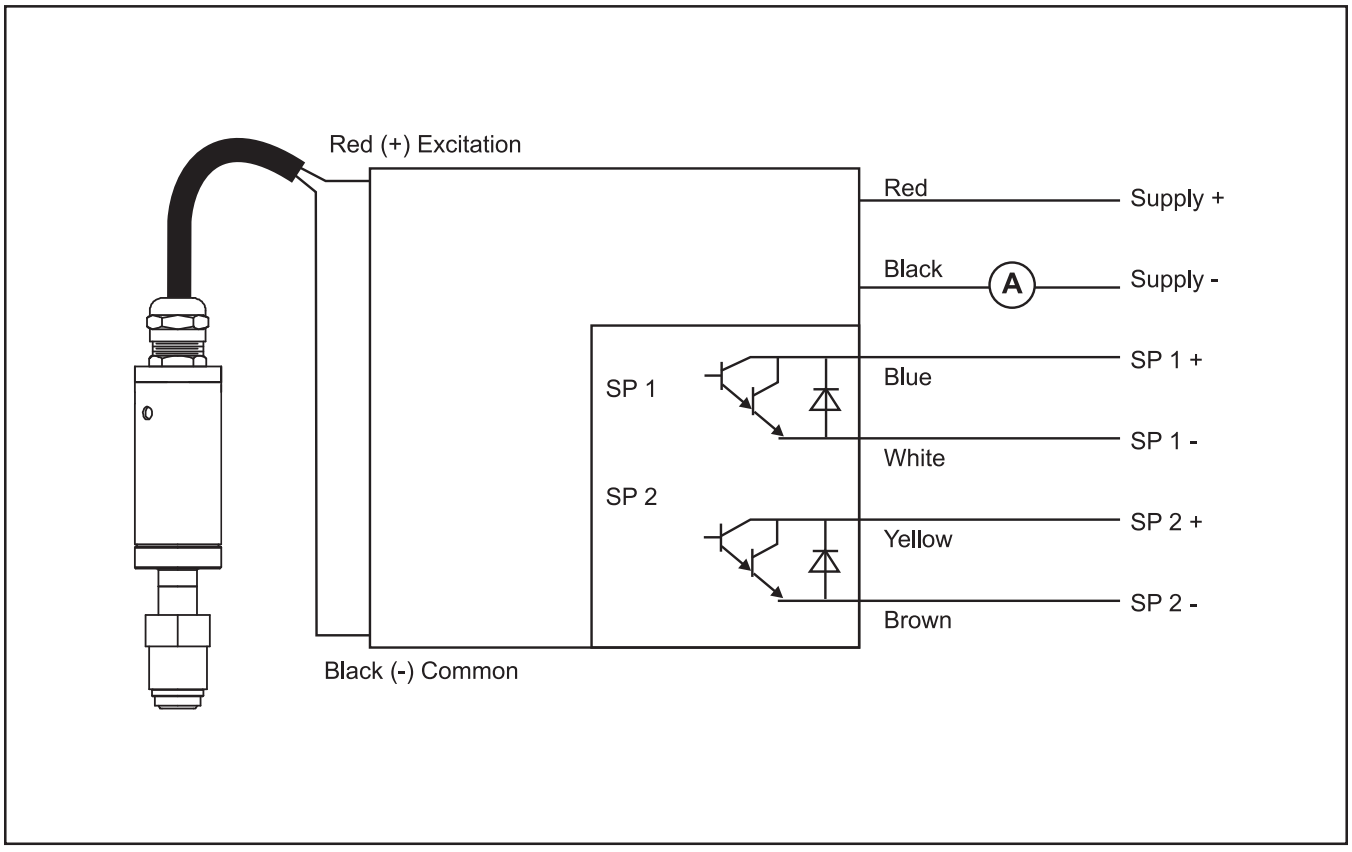
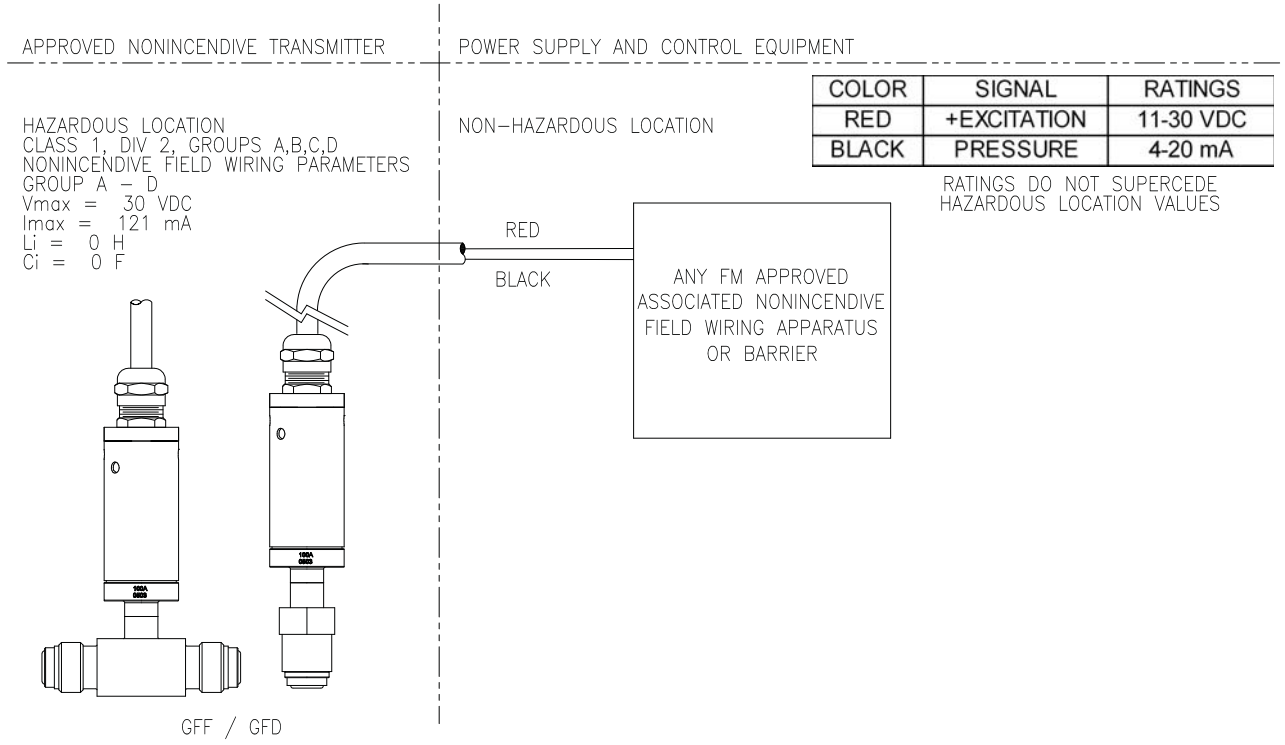


 Figure 2-6 4-20 mA Output Device Wiring to LR056

2-9 Installation Instructions - Non-Incendive Field Wiring

2-9-1 Non-Incendive Field Wiring 4-20 mA



Notes:

1. The non-incendive field wiring curcuit concept allows interconnection of non-incendive wiring apparatus with associated non-incendive field wiring apparatus using any of the wiring methods permitted for unclassified locations.
2. Vmax > Voc or Vt, Ca > Ci + C cable, La > Li + L cable.
3. For this current controlled curcuit, the parameter (I max) is not required to be aligned with parameter (Isc or It) of barrier or associated non-incendive field wiring apparatus.
4. Installation shall be in compliance with the NEC.

Figure 2-7 Non-Incendive Field Wiring for 4-20 mA

2-9-2 Non-Incendive Field Wiring 0-5 Vdc

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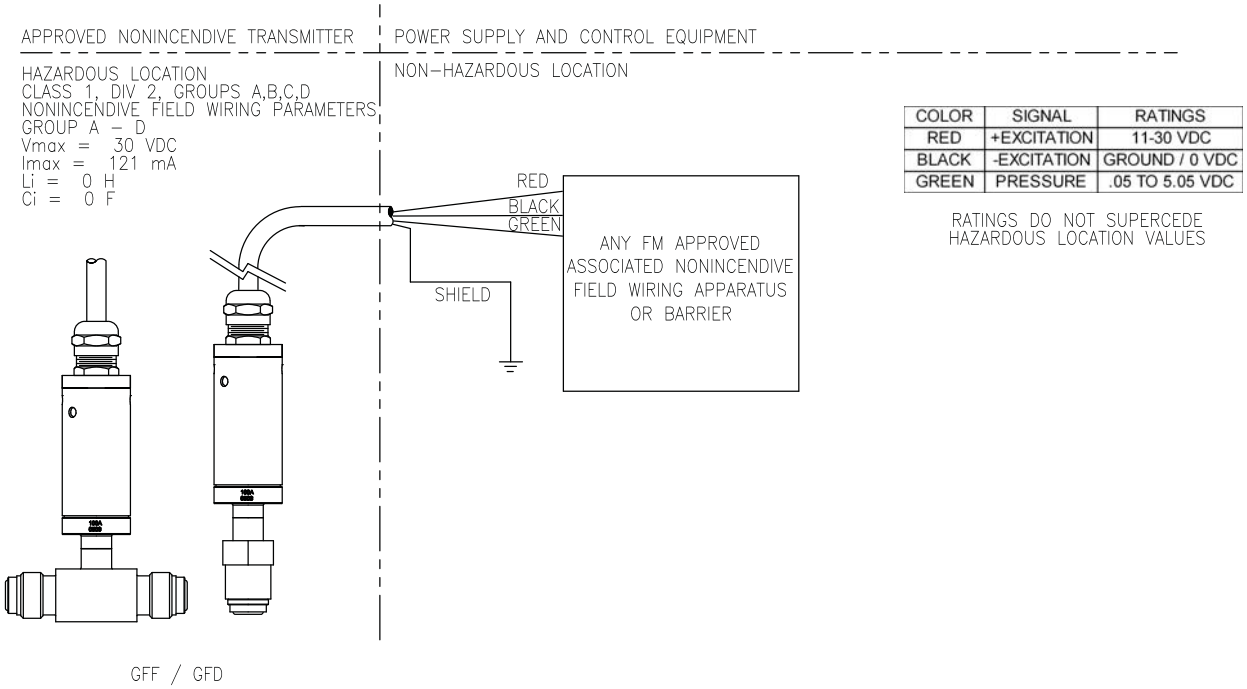

COLOR	SIGNAL	RATINGS
RED	+EXCITATION	11-30 VDC
BLACK	-EXCITATION	GROUND / 0 VDC
GREEN	PRESSURE	.05 TO 5.05 VDC

RATINGS DO NOT SUPERCEDE
HAZARDOUS LOCATION VALUES

Notes:

1. The non-incendive field wiring curcuit concept allows interconnection of non-incendive wiring apparatus with associated non-incendive field wiring apparatus using any of the wiring methods permitted for unclassified locations.
2. Vmax > Voc or Vt, Ca > Ci + C cable, La > Li + L cable.
3. For this current controlled curcuit, the parameter (I max) is not required to be aligned with parameter (Isc or It) of barrier or associated non-incendive field wiring apparatus.
4. Installation shall be in compliance with the NEC.

Figure 2-8 Non-Incendive Field Wiring for 0-5 Vdc

2-10 Zero Adjustment

The SolidSense II pressure transducer is factory calibrated and does not normally need a field adjustment. If a field adjustment becomes necessary, adjust the zero as noted below.

2-10-1 Zero Adjustment (SolidSense II Standard Pressure Transducers)

On standard SolidSense II pressure transducer models, the zero adjustment screw is located on the body as shown in Figure 2-8.

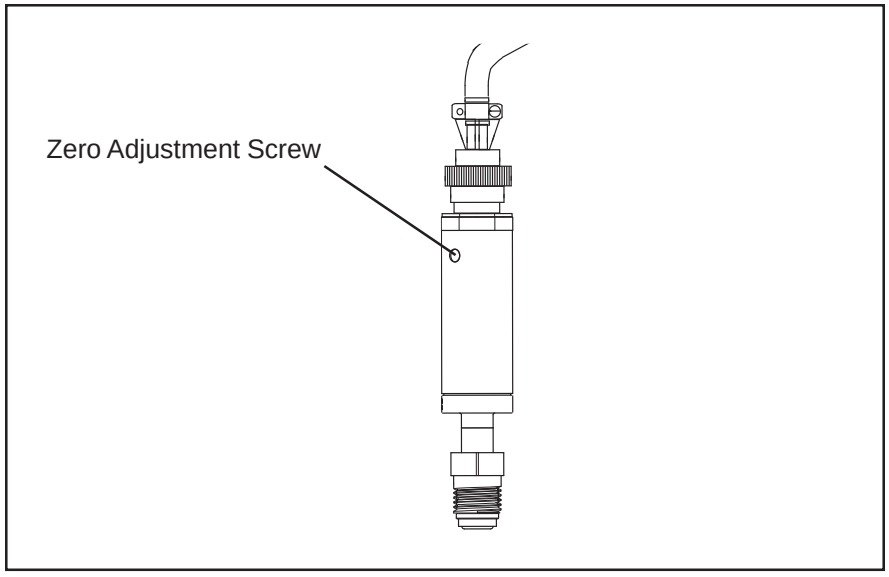

Figure 2-9 Zero Adjustment Screw Location on the (Standard SolidSense II pressure tranducers)

Position the SolidSense II pressure transducer with the electrical connector facing pointing upward. Using a small, flat-bladed screw driver, turn zero adjustment screw in a clockwise direction to increase the signal. Turn the screw in a counterclockwise direction to decrease the signal.

2-10-2 Zero Adjustment (ATEX SolidSense II Pressure Transmitters Only)

On ATEX SolidSense II pressure transmitters, the zero adjustment screw is located underneath the access cover nut as shown in Figure 2-10(A-B). Unscrew the access cover by turning it in a counterclockwise direction with the electrical connector pointing upward. The cover should drop down after five complete revolutions.

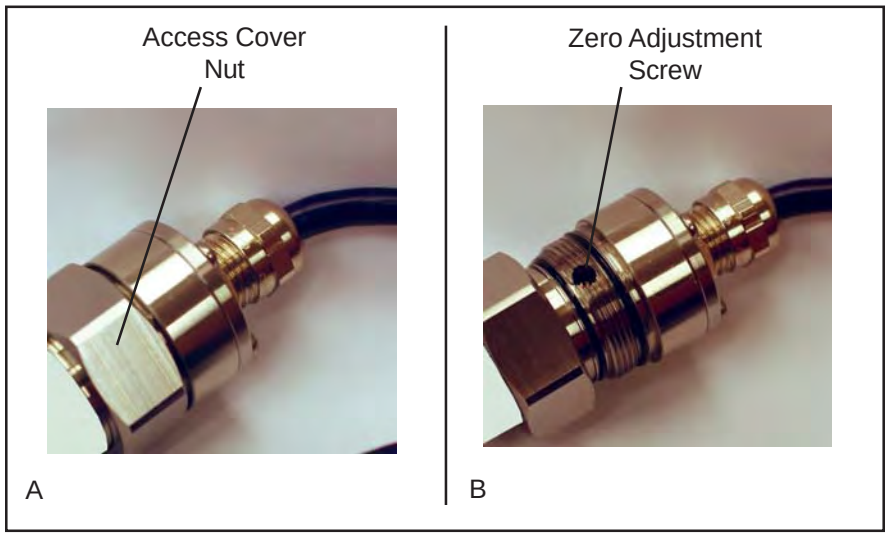

Figure 2-10 Location of the Zero Adjustment Screw on the (ATEX SolidSense II Pressure Transmitters)

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SolidSense II Series

LIMITED WARRANTY

Seller warrants that the Goods manufactured by Seller will be free from defects in materials or workmanship under normal use and service and that the Software will execute the programming instructions provided by Seller until the expiration of the earlier of twelve (12) months from the date of initial installation or eighteen (18) months from the date of shipment by Seller. Products purchased by Seller from a third party for resale to Buyer ("Resale Products") shall carry only the warranty extended by the original manufacturer.
All replacements or repairs necessitated by inadequate preventive maintenance, or by normal wear and usage, or by fault of Buyer, or by unsuitable power sources or by attack or deterioration under unsuitable environmental conditions, or by abuse, accident, alteration, misuse, improper installation, modification, repair, storage or handling, or any other cause not the fault of Seller are not covered by this limited warranty, and shall be at Buyer's expense.
Goods repaired and parts replaced during the warranty period shall be in warranty for the remainder of the original warranty period or ninety (90) days, whichever is longer. This limited warranty is the only warranty made by Seller and can be amended only in a writing signed by an authorized representative of Seller.

BROOKS SERVICE AND SUPPORT

Brooks is committed to assuring all of our customers receive the ideal flow solution for their application, along with outstanding service and support to back it up. We operate first class repair facilities located around the world to provide rapid response and support. Each location utilizes primary standard calibration equipment to ensure accuracy and reliability for repairs and recalibration and is certified by our local Weights and Measures Authorities and traceable to the relevant International Standards.

Visit www.BrooksInstrument.com to locate the service location nearest to you.

START-UP SERVICE AND IN-SITU CALIBRATION

Brooks Instrument can provide start-up service prior to operation when required.
For some process applications, where ISO-9001 Quality Certification is important, it is mandatory to verify and/or (re)calibrate the products periodically. In many cases this service can be provided under in-situ conditions, and the results will be traceable to the relevant international quality standards.

CUSTOMER SEMINARS AND TRAINING

Brooks Instrument can provide customer seminars and dedicated training to engineers, end users and maintenance persons.

Please contact your nearest sales representative for more details.

HELP DESK

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Due to Brooks Instrument's commitment to continuous improvement of our products, all specifications are subject to change without notice.

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